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AGRICULTURAL Research

U.S. DEPARTMENT OF AGRICULTURE

CONSUMER BENEFITS FROM RESEARCH

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AGRICULTURAL
Research

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Research and the Consumer

Scarcely an hour of your day goes by without a product of agricultural research touching your life. You may even have begun this day with just such a product—a glass of orange juice from frozen concentrate.

This issue of AGRICULTURAL RESEARCH points up a few examples of USDA research that benefit you as a consumer. You encounter many every day.

As you dress for a casual Saturday afternoon, for example, you may slip into a wash-and-wear shirt made from drip-dry cotton. And you might put on a pair of wash-and-wear wool slacks, now on the market, tailored from Wurlanized wool.

Out in the yard, you control weeds and insects and plant grass and flowers based on recommendations—and often products—that are an outgrowth of research. You can paint your house with a linseed-oil paint that has all the convenience of a water-based paint.

Results of agricultural research are at hand whether you are cooking or shopping.

At mealtime those leaner pork loins or chops may be traced to meat-type hogs. Or, if you charcoal-broil steak or chicken, you enjoy improved tenderness due largely to better feeding and management of livestock.

On your vacation, while you and your family swim, boat, and fish, upstream crop producers are applying scientific land-use practices to their lands. Their actions help preserve and improve recreation—by reducing the flow of silt into streams, rivers, and lakes (page 5, this issue). Some of these same land-use measures are being applied by urban developers in preparing large tracts of land for the construction of new homes. The developers are using soil conservation practices to prevent soil from being carried away to clog our rivers, hamper navigation, and spoil recreation.

Even when you are sick, you may benefit from agricultural research. Your physician might prescribe penicillin, for example, a product that is reasonably priced because agricultural research first developed a method for mass producing the drug.

Special Issue: Consumer Research

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Agricultural Research Service

Puffed carrots (two rows at far right) are table ready after only 5 minutes in the pot, yet they taste and look like regular carrots. Much more cooking is needed for fresh carrots (left) and those conventionally dehydrated (center).

Explosion Puffing

New dehydration process provides quick-cooking vegetables and fruits that taste fresh

■ Dehydrated foods, once a military necessity and now a convenience boon to housewives everywhere, may soon embrace a whole new family of products that stem from the discovery by ARS engineers of "explosion puffing."

The new process makes it practical to dehydrate whole pieces of fruits and vegetables so that they require only 5 or 6 minutes of a housewife's time to cook. Their counterparts, those dehydrated conventionally, take 20 minutes to an hour to cook.

One commercial firm is already producing explosion-puffed dehydrated carrot dice on a limited scale.

Engineers R. K. Eskew and James Cording, Jr., developed the process at the Eastern utilization research laboratory, near Philadelphia, where scientists have made numerous pilot-plant samples, including—

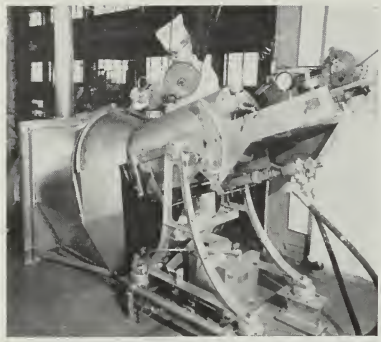
Apple slices for pies and compotes, for eating as a snack without cooking, or for mixing with dry cereals; chunks of potatoes and carrots that can be used in soups or stews or eaten as a side vegetable; blueberries that could be packaged in plastic bags with muffin or pancake mixes to give better flavor and permit packaging economies; and pieces of beets, turnips, and sweetpotatoes for a variety of uses.

In developing the puffing process, utilization scientists recognized that conventionally dehydrated foods, besides being less expensive to ship and to store than fresh products, save the housewife time otherwise spent in peeling, coring, and slicing. But they knew, too, that conventionally dehydrated fruit and vegetable pieces have to be cooked even longer than the fresh.

To overcome this, Eskew and Cording sought a process that would create air spaces within the vegetables and fruits, permitting water to be removed readily during drying—and to be replaced rapidly during cooking.

They exploded partially dehydrated pieces of fruits and vegetables from a low-pressure puffing gun. The explosion created a porous structure within the pieces but did not alter their texture, size, or shape when reconstituted.

The gun they devised for the process is the same as the one used for



Ready . . . aim . . . puff!

puffed wheat, consisting basically of a rotating cylinder with a clamped lid at one end. The closed loaded cylinder is revolved, while being heated by gas jets, to prevent the product from scorching. When the required temperature and pressure are built up, the lid is suddenly opened and the contents ejected.

When pieces are exploded, some of the water within them is instantly vaporized and escapes, forming tiny pores and cavities in the pieces. In the final drying step, the heat draws out the remaining moisture quickly through these openings. This shorter processing time helps maintain the flavor of fresh foods in the product.

The process does not entail a great increase in cost, since much of the additional expense of puffing is offset by subsequent savings in dehydration. The last moisture removed in normal dehydration is the costliest part of the operation, consuming most of the heat-energy and time.

When these explosion-puffed, dehydrated fruit and vegetable pieces are cooked, it is difficult to distinguish them from fresh-cooked foods. The researchers say that explosion puffing should not affect nutritive value any more than conventional dehydration.

They have established for many fruits and vegetables the right moisture content at time of explosion, the required gun pressures, and the best pre- and post-explosion drying conditions. The work is now being extended to other foods.☆

"Irrigating" Houseplants

Simple device used for research will improve plant care in the home

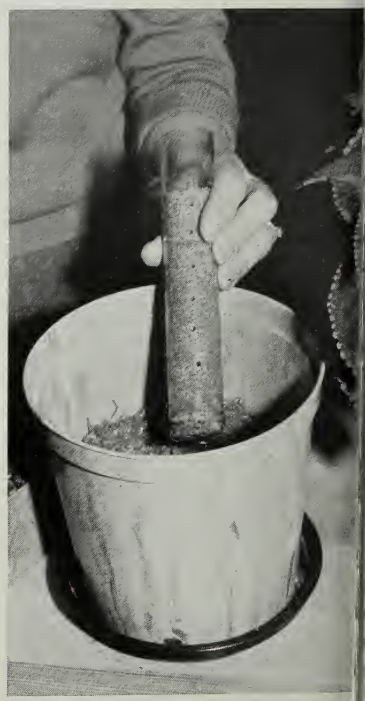
■ Homemakers can give their houseplants the right amount of water by following a procedure devised by ARS and Arizona Agricultural Experiment Station scientists for irrigating potted plants used in experiments.

Watering from the surface is most convenient in both home and laboratory, but supplying enough water without waterlogging the soil is difficult. Surface watering may also encourage plant disease and cause soils to become crusted and compact.

C. O. Stanberry of ARS and R. H. Maier of the Arizona station avoid wetting the soil surface by using a watering column in each pot.

The column consists of a length of perforated polyethylene tubing filled with silica sand and placed vertically in each 6-inch pot. The tube, 1 inch in diameter, is closed at the bottom and extends about 2 inches above the soil surface. Water poured into this sand-filled tube reaches the soil through four 1/8-inch openings. The scientists advise putting no openings in the bottom inch of the tube to avoid ponding of water at the base of the pot.

Suitable polyethylene plastic tubing is available at many garden and dairy supply stores, plant nurseries, and hardware stores. Stanberry says iron pipe may be substituted for the plastic tubing, but he warns against using copper or brass tubing. The copper in these tubings may be toxic to plants.☆



All that's needed is a length of tubing and a little know-how. Seal base of tube with cork or other plug. Drill tiny holes, down to bottom inch. Set tube vertically in pot, add soil, and fill the tube with medium sand. Avoid very fine sand or large-grain sand, which would clog the holes.

CLEAR WATER

For recreation, industry, and family needs

A clear-running stream is a thing of beauty—and it may be a prime reason why an industrial plant locates in one community rather than another.

Maintaining an adequate supply of clean water is one of the most pressing

problems of our highly urbanized and industrialized Nation. So ARS research on conserving and managing water on agricultural watersheds is of vital concern to every citizen.

To 21 million licensed fishermen, 50 million swimmers, and 8 million owners of pleasure boats, water plays an incalculably important part in recreation and family life. And millions more live or relax beside beautiful streams and lakes or live in cities, which must have a reliable water supply.

A single example indicates the industrial demand for water: Refining a barrel (42 gallons) of petroleum requires 770 gallons of water, and U.S. refineries are processing 8 million barrels of oil a day.

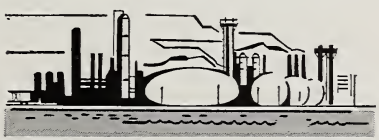
ARS research is helping conserve our water resources by—

- Developing effective ways to control sediment, the largest single pollutant in the Nation's streams.
- Providing information needed to protect and develop the resources of agricultural watersheds. USDA surveys indicate that 8,300 agricultural watersheds need flood-prevention systems, water-supply works, and recreational areas, as well as water-conservation measures to meet agricultural needs.

The engineers seek to discover the natural laws controlling hydrology and sedimentation processes. Then, having learned what will happen under a given set of conditions, they can recommend how to manage the land and what type of engineering structures to build for managing and conserving the water.

Sedimentation research deals with water erosion from dislodgement of a soil particle by a raindrop through the complexities of siltation in streams.

At USDA's Sedimentation Laboratory, Oxford, Miss., researchers are studying the interrelated influences of soil type, land use, climate, and geology on sediment production. They are also determining what conditions make stream channels resistant or susceptible to erosion, and how soil particles are dislodged, transported, and deposited in streams. At other locations, investigators are concen-



trating on specific phases of the sediment problem.

Reducing silt in streams directly affects taxpayers who finance dredging of silted rivers and harbors or pay for reservoirs to replace those clogged with sediment. And clearing up a stream may draw industry to economically depressed communities.

Residents of river-valley cities—and all other taxpayers—benefit from ARS hydrology research that helps designers plan more effective and less costly flood-prevention and water-conservation structures.

For instance, if a designer knows a dam will need to control floods no greater than 5 inches of runoff in 24 hours, he can recommend a dam and reservoir to handle a flood of that size. Otherwise, he must design a much larger and more expensive dam to provide a greater margin of safety.

Planners of recreational areas and water-supply systems also need ARS hydrologic information in estimating how much water a stream will deliver.

ARS engineers are improving means of predicting size and frequency of floods, effect of dams on the stability of the stream channel,

and the dependable water yield of a watershed before and after land-conservation measures and structures are used.

The U.S. Hydrograph Laboratory, Beltsville, Md., is using high-speed computers to analyze the magnitude, frequency, and distribution of precipitation and is improving procedures for estimating a flood's progress down stream.

At major watershed-research centers in Arizona, Oklahoma, Idaho, and Missouri, and at 13 other locations, researchers are investigating the effect of local climate, soils, land use, and geology on water use and flood flows of streams.

From these diverse studies will come the tools for making accurate estimates, so that the natural resources of agricultural watersheds can be protected and utilized at the least cost.☆

Precision Testing for Vitamin B_6

New method pinpoints B_6 content of flour, baby cereals, breakfast foods

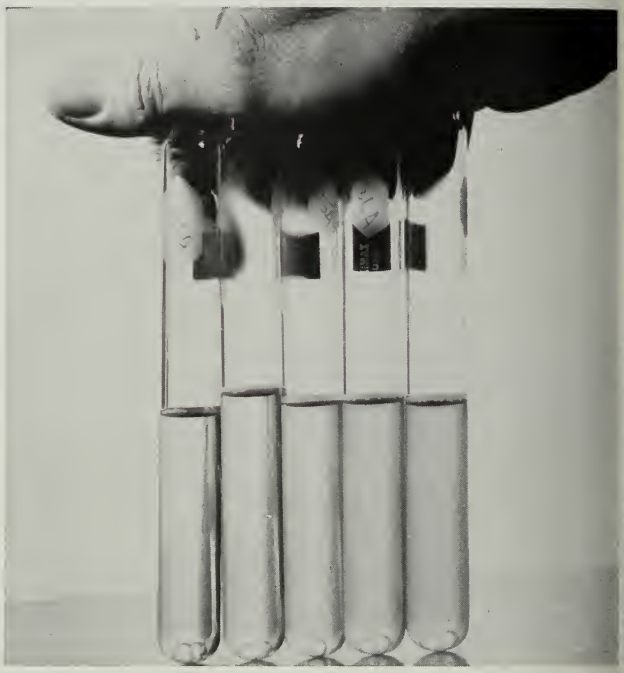
■ ARS food chemists have developed a method for accurately determining the three components of vitamin B_6 in foods and have used the procedure to analyze grain and cereal products.

The method, a combination of microbiological assay and chromatographic separation, was developed by Marilyn Polansky, Joanna Lehmann, and E. W. Toepfer at Beltsville, Md. The National Academy of Sciences has commended their work as a significant improvement in methodology that will make it possible to secure needed information on the vitamin B_6 content of foods.

Previous research has established that vitamin B_6 is essential to human life at all ages. But more information on this vitamin must be obtained before minimum daily requirements can be established by-the National Academy of Sciences-National Research Council, which sets recommended nutritional allowances. Chemically, vitamin B_6 has three closely related components—pyridoxine, pyridoxal, and pyridoxamine. These compounds occur naturally in food both separately (in a free form) and in combined forms.

Microbiological assay, the method presently used for the determination of vitamin B_6 in foods, is based on the observation that certain micro-organisms such as bacteria, yeasts, and molds require specific vitamins for growth. The method involves comparing the growth responses of a particular micro-organism in solutions containing unknown quantities of the vitamin being tested and in control solutions.

When a single test organism is used in testing for total vitamin B_6 values, however, the microbiological assay is known to have an imperfection: Growth responses of the micro-organisms to the three chemically related forms of vitamin B_6 differ from one organism to another and also from one B_6 component to another for a specific organism.



Cloudier solutions, caused by greater growth response of yeast, indicate more vitamin B_6 in test tubes at right than in the others.

To overcome this inaccuracy, the ARS scientists devised a method of chromatographically separating the three components so that they could be assayed separately, and chose a single yeast species (*Saccharomyces carlsbergensis*) as the test organism.

Chromatographic separation of the three components, followed by microbiological assay, permits true values to be established for vitamin B_6 components in food extracts.

Food samples are first heated under pressure with a dilute acid solution. The resulting solution contains the components of vitamin B_6 in a form that the test organism can use. This solution is poured into a column of specially prepared ion exchange resin. The resin column retains the vitamin B_6 and allows the separation of each component in individual fractions. The fractions are then used in the microbiological assay.

Vitamin B_6 values for 56 samples of grains and grain products such as flours and meals, breakfast cereals, breads, and infant cereals have recently been determined by the chromatographic-microbiological method.

Most whole grains were found to contain 2 to 4 micrograms of vitamin B_6 per gram. Highly processed cereal products, however, contained less than 1 microgram per gram. Refining probably caused the difference.☆

Food Budgeting

Tailormade food plans help homemakers balance meals and budgets

■ Helping homemakers choose the right foods in right amounts—at prices they can afford—is a continuing goal of ARS research.

Nutritionists and food economists work together in research to get the necessary basic information, and use this data in preparing food plans, or budgets, as guides for homemakers.

The plans are widely used both in the home and by nutritionists, teachers, social workers, and numerous other specialists.

ARS food plans are developed at four different cost levels—economy, low cost, moderate cost, and liberal cost—to take into account the habits and practices of families in different income ranges. All plans meet the nutritional recommendations established by the National Research Council. Costs are based on figures from the Bureau of Labor Statistics.

The economy and low-cost plans have more potatoes, dry beans and peas, flour, cereals, and baked goods. In proportion to cost, these foods give relatively high return in calories, protein, iron, and B vitamins. The moderate-cost and liberal-cost plans have more meat, eggs, fruit, and vegetables other than potatoes. Milk is prominent in all four plans because of its high calcium content, high-quality protein, and other essential nutrients.

Particular choices within each food group will raise or lower the cost of the plan. The food economists assume that families using the low-cost plans would choose more of the inexpensive foods in each group. The moderate-cost plan, on the other hand, allows for some of the higher priced cuts of meat and a few out-of-season foods.

Menus based on the low-cost plans will be simple, will include foods requiring considerable home preparation, and will call for skill in cooking to make varied and appetizing meals. The moderate-cost plan allows for menus with greater variety, some frills, and less home preparation.

The ARS-developed food-cost plans are used in many ways—

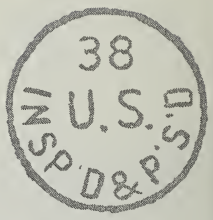
- As a guide in counseling programs by nutritionists.
- In teaching food management.
- By many welfare agencies, as a basis for estimating money allotments for food and, in part, for determining the ability of families to pay for social services.
- By social workers, lawyers, and judges, who often use the food costs as a base for setting foster care and dependency fees.
- By economists, in estimating potential demand for agricultural products.
- By farm families, as a guide for planning food production and preservation.

Food plans are available in a series of publications. The newest publication, "Family Food Budgeting—For Good Meals and Good Nutrition" (HG 94), is designed to help families of any size, and with any combination of age and sex. With this guide, the homemaker can determine the needs of her family and select the kinds and quantities of foods to meet these needs on a weekly basis.

Other publications in this series are "Food for the Family with Young Children" (HG 5), based on the moderate-cost food budget; "Food for Families With School Children" (HG 13), based on the low-cost budget; "Food Guide for Older Folks" (HG 17), based on the low-, moderate-, and liberal-cost budgets; and "Food for the Young Couple" (HG 85), based on the moderate-cost budget.

Another publication, "Family Food Plans and Food Costs" (HERR 20), was designed expressly for nutritionists and other leaders who develop or use food plans.☆

The Mark of Wholesome Meat



Federal inspection keeps pace with Nation to safeguard consumer health

■ Changes in the Nation's meat production and meat inspection regulations have been as vast as changes in transportation since the turn of the century.

Methods used in the early 1900's would be as out of date today as a horse and buggy on a superhighway crowded with high-powered, air-conditioned automobiles.

Meat inspection is one of the oldest services provided by the Federal Government to protect consumers. The Meat Inspection Act prescribing Federal inspection for all meat and meat products moving across State lines became law on June 30, 1906—the same day the Food and Drug Act was signed. Both have been amended to keep pace with changing times.

When the livestock industry was young, people who ate meat had a close association with its production. Many families butchered their own cattle, hogs, and sheep; cured hams and bacon; and prepared their own sausages, lard, and other meat products.

The producer-consumer was his own inspector. He was careful to select only animals that appeared sound and healthy as food for his family or neighbors.

As the country grew, meat processing shifted away from the farm. By 1906, slaughtering, curing and processing had begun to be centralized on a mass-production scale with assembly-line techniques.

Conditions in some plants were so unsanitary that the American people demanded and got specific reforms—because they could no longer protect themselves. The Meat Inspection Act was passed to assure that only healthy animals would be used for food, and that carcasses and meat would be handled with the utmost care to provide clean, wholesome meat. The law requires this inspection for all meat and meat products moving in interstate and foreign trade.

Meat that carries USDA's stamp of approval has met strict health standards.

Today, few people see their meat while it is "on the hoof." And many meats and meat foods now come ready to pop in the oven and heat, with the grinding, seasoning, mixing—even roasting—already done.

Industry's advances to give consumers more built-in services have necessitated changes in Federal meat inspection procedures. For instance, innovations in the frozen foods industry have come rapidly. To assure adequate safeguards, ARS meat inspection officials have had to evaluate methods of meat preparation for freezing, packaging of frozen products, and time and temperature relationships during freezing.

Approved products show a circle with the legend, "U.S. Inspected and Passed by Department of Agriculture." Fresh meats and some cured products carry a purple stamp, "U.S.INSP'D & P'S'D." (A number in the seal identifies the packing plant.) The purple circle is seldom seen today in markets that carry prepackaged, serving-size cuts. It is

often trimmed off when commercial cuts are prepared for retail sale.

Labels are reviewed carefully. Specialists analyze meat product formulas and evaluate contents and the packer's claims before the products are allowed to carry the mark of Federal inspection.

Labels for federally inspected canned or packaged meat must list all the ingredients, the common or usual name of the product, the name and address of the processor or distributor, as well as the mark of approval. Weights shown must be accurate. These requirements for adequate, truthful information further safeguard consumers.

The Meat Inspection Division maintains nine laboratories for biological tests and chemical evaluation to aid inspectors in maintaining effective control. Last year, these laboratories examined nearly 150,000 samples of meat and meat-food products and the materials used in their processing.

Every substance used in a meat product, and every piece of machinery or other material coming in contact with the product, must pass inspection before it can be used. Say that a packer wants to use a newly developed plastic wrap. Before he can use it on federally inspected meats, it must be shown that it is without deleterious effect.

Protein content of a meat product is checked with this equipment in a meat inspection laboratory.

About 65 percent of all prepared meat products, such as hams, bacon, sausage, canned meat, and frozen meat dinners, are processed under Federal supervision. About 83 percent of all animals slaughtered commercially move through federally inspected plants, where supervision is continuous and each animal and carcass is examined individually.

Federal inspection is uniform across the country. Regulations provide rigid standards of safety, sanitation, and wholesomeness—whether the product is packed in Omaha or Atlanta, Los Angeles, or New York.

Imported meat, also protected by Federal inspection, is processed under an inspection system comparable to our own. This is assured by review, negotiation, and observations of the inspection programs in the countries of origin, certification of the meat by inspection officials of those countries, and reinspection of the products at time of entry into the United States.

Consumers can rest assured that the Federal mark of wholesomeness must be earned. It marks *only* those meats that have passed rigid tests.☆

Here a veterinarian is examining hogs to weed out any that may be unfit.

Ready for ready-to-serve label?

Flavor-True Soybean Oil

Fine food oils are being perfected through research

■ ARS research on flavor of soybean oil has played a major role in establishing this midwestern farm product as the principal food fat in the United States.

Domestic consumption of soybean oil has soared from practically nothing 25 years ago to more than 3.5 billion pounds a year. Soybean oil now accounts for about two-thirds of all domestic vegetable oil, three-fourths of all margarine, half of all shortening, and half of all salad oil.

In helping make this increase possible, ARS chemists at the Northern utilization research laboratory, Peoria, Ill., have shown how to minimize oxidation and prolong freshness in soybean oil. They have identified the flavor-destroying culprit as linolenic acid, which readily oxidizes when exposed to the air. This oxidation can continue, and off-flavors may keep forming, as the oil ages on store and cupboard shelves—or if it is repeatedly heated as in deep-fat cooking.

In their work to improve the storage quality of soybean oil, Peoria chemists learned that iron, copper, and other metals—even in minute traces—greatly speed up the oxidation of linolenic acid. The metals occur normally in crude soybean oil, but especially damaging amounts may be picked up from processing equipment.

Some of the commercial processing methods once used actually increased the oil's iron content by as much as 40 times. Processors have since turned to stainless steel and nickel for use in equipment that comes into contact with oil at high temperatures.

Metal deactivators—substances that "tie-up" metals by combining with them—are also being used to combat off-flavors. This development came after the chemists learned that German oil refiners added citric acid to soybean oil to deactivate lecithin.

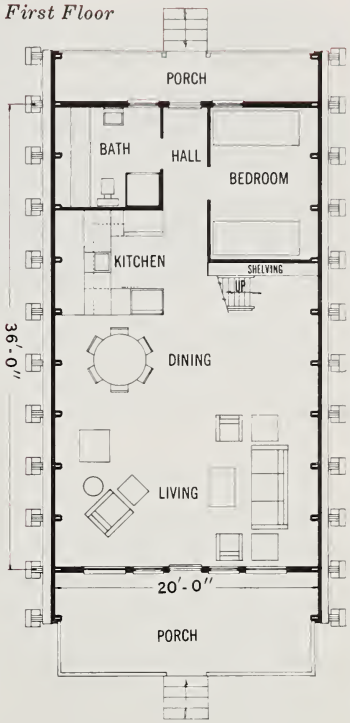
The scientists found, however, that citric acid's true role is that of deactivating metals. They have continued work along this line, searching for natural deactivators and studying how to synthesize others that are fat-soluble, nontoxic, tasteless, and suitable for use in industry.

The Peoria laboratory's oil evaluation procedure, combining tasting with statistical analysis, is considered a key link in the research program. No chemical or physical tests are sensitive enough to evaluate oil flavor. The evaluation procedure is recognized as a major accomplishment and has been adopted by industry.

Another development that is attracting industrial interest is an analytical procedure for detecting "hidden oxidation." Off-flavors can be removed from soybean and other oils by a refining process, but odorless, flavorless substances remain and cause off-flavors to develop again—much faster than in fresh oil. This new procedure detects these hidden oxidation products.

Current research is directed toward improving stability of soybean oil that is repeatedly heated to high temperatures. Major emphasis is on finding catalysts that are more selective than those used now for converting linolenic acid by hydrogenation to a less reactive fatty acid.

Recent studies at the Northern laboratory and in industry show that a combination of selective hydrogenation, a process called winterization, and addition of preservatives improves stability of soybean oil at cooking temperatures. In this combination, selective hydrogenation converts more than half of the linolenic acid to less reactive fatty acids. Winterizing consists of chilling the oil to about 45° F. and filtering out crystallized solids, which cause cloudiness if left in the oil.☆



A-Frame Cabins

Easy-to-build units offer comfort and atmosphere

■ Two new A-frame cabins—ideal for vacation headquarters—have been developed by ARS architects and housing specialists for people who like to hunt, fish, ski, or just relax.

One is a 36-foot cabin with three bedrooms and 1,108 square feet of floor space. The other is a 24-foot cabin with two bedrooms and 768 square feet of floor space. Each cabin is 20 feet wide and can be built by two or three men with a little construction know-how.

Main supports for the cabins, which are two stories high, are A-shaped frames set on pairs of concrete footings. The lower halves of the frames are erected first, then the first and second floors are roughed in. The second floor serves as a working platform for completing the upper halves of the A-frames.

The roof is closed in by nailing plywood or other decking material to the framework and then covered with shingles.

A 3-foot crawl space allows air to circulate beneath the cabin and prevents accumulation of moisture. This space can be used for storing a small boat or other recreational equipment.

The first floor of the large cabin has one twin-size bedroom, a 20- by 20-foot living-dining area, a bathroom with a stall shower, and a kitchen with space for a sink, small range, and full-size refrigerator. An electric water heater can be installed under the kitchen counter.

The second floor, which is reached by a ship's ladder, has two bedrooms and an 8- by 10-foot balcony that overlooks the living-dining area. The balcony is an added feature of the large cabin. In both plans, the roof's slope makes the second floor about half the width of the first floor.

The cabins do not have fireplaces, but prefabricated units with chimneys can be installed. The designers suggest installing electric baseboard heaters if the cabin will be used in cold weather. Otherwise, small portable electric heaters can be used.

Working drawings of Plan No. 5965 (36-foot cabin) and Plan No. 5964 (24-foot cabin) are available from extension agricultural engineers at most State agricultural colleges. There is usually a small charge.☆

Insects That Pester Man

Comprehensive research is outwitting insects that threaten health and comfort

■ Serious problems with insects that attack man or infest households are regarded by many Americans as incidents of the past. The assumption is natural—many people in this country have never suffered illness or serious discomfort caused by mosquitoes, houseflies, mites, ticks, fleas, ants, or bedbugs.

Entomologists, however, know that we do not have the final answers for dealing with these pests—still serious threats to health and comfort in many parts of this country and the rest of the world. Present control methods—although good—are not ideal. So ARS and other entomologists are working extensively to develop new or improved methods of control.

A striking feature of current ARS work is the emphasis on basic research and new approaches to control. Gradually, this research is producing the information needed to develop advanced techniques such as the use of attractants and sterilization, and to fill in the gaps in existing knowledge about insect biology, physiology, and nutrition. Some examples of these studies:

● In Oregon and California field studies, scientists kept mosquitoes under almost constant observation to get information about this insect's daily activities. They were particularly interested in exodus from and return to daytime resting shelters. Apparently this movement is regulated by light intensity—a behavioral trait that scientists might be able to take advantage of.

● In Florida, research is continuing on the development of chemosterilization for controlling or eradicating insects. Florida-based scientists evaluated 886 new chemicals in one year for sterilant activity in houseflies. In addition, these scientists have tested various formulations and types of baits for administering chemosterilants to the insects. Test results with both dry baits and liquid paint-on baits are encouraging.

● Other recent basic studies include testing of 63 compounds for systemic insecticidal or repellent action against body lice; 25 compounds in a search for repellents or other methods of protecting humans from mites, ticks, and fleas; and 256 new compounds to find new chemicals for use on clothing to repel either ticks or chigger mites.

Insecticides remain the primary defense against insect attacks, and probably there will never be a suit-

Research workers stretch out on heavily chigger-infested ground to field test repellent-treated clothing. One uniform is untreated; each of the others has been treated with a different repellent that proved effective in laboratory tests.

able substitute to control some species. Also, sanitation certainly will never be outmoded. So continuing research on control through insecticides and sanitation is an important part of work toward better methods of combating insects.

In the search for better insecticides, ARS scientists are continually adding to the already impressive total of chemicals screened (at least 20,000 for mosquitoes alone). Some figures of chemicals screened in a single year: 81 compounds and 109 plant extracts for effectiveness against the common malaria mosquito; 50 new compounds as contact sprays and 10 new compounds for residual effectiveness against German cockroaches; 299 compounds in body lice tests; and 41 compounds for effectiveness against bedbugs.

Only a few of the chemicals prove effective among the thousands tested.

Research on physical control also is prominent in current activities. A good example is the effort to improve on water-management practices, which is aimed at eliminating mosquito breeding places and at the same time permitting maximum use of water resources for irrigation, recreation, and wildlife.

In developing these practices, scientists first concentrate on biological studies to get information on habits of the insects. They follow through with engineering studies to develop ditch designs and techniques of spreading and impounding water that will take advantage of the habits. Such studies have already produced valuable information on how to apply irrigation water without providing breeding places for mosquitoes.

Current ARS research is designed to find the many well-hidden weak points in insects and, based on these weaknesses, to develop better ways of controlling insects that attack humans and invade households.☆

A Waterer For Honey Bees

Unit reduces nuisance of bees seeking water around homes and at livestock tanks

■ ARS agricultural engineers at the Wisconsin and Arizona Agricultural Experiment Stations have designed a watering "trough" for honey bees to help maintain production.

Honey bees must have water to cool their colonies and to dilute their own honey food supply.

The waterer also can be useful in reducing annoyance caused by bees in their search for water. In rural areas, too many bees around a livestock watering tank may cause animals to shy away from the tank. In urban areas, bees may become a nuisance in seeking water around homes where a housewife is hanging out laundry, or where someone is washing a car or watering the lawn.

The waterer consists of a 2-inch thick sponge-floating in a galvanized steel pan, 3- to 4-inches deep—a float device to control the water, and a canopy for shade. Bees land on the floating sponge, take up water, and carry it to their hives.

B. F. Detroy at Madison, Wis., is testing sponges with different pore sizes. He has found that bees prefer large pores on warm days and small pores on cool days.

Detroy believes bees prefer the larger pores on warm days because faster evaporation from these pores produces a cooler sponge surface. On cool days, the bees chose the smaller pores, which have a slower evaporation rate and give the sponge a warmer surface.

The sponge, similar to those used in the home but with smaller pores, covers the pan surface and prevents the bees from drowning. The water level is controlled by a float device—the same type used for livestock watering tanks—connected to the water system.

The canopy, made of wood and plastic, shades the sponge to prevent excessive evaporation and helps keep out excess water when it rains.

Previous research by ARS agricultural engineer C. D. Owens and ARS apiculturist A. W. Woodrow at Tuscon, Ariz., has shown that honey production drops when bees have to spend too much time carrying water to the hives (AGRICULTURAL RESEARCH, March 1962, p. 15). Researchers are now making studies to determine where the water should be placed in relation to the bee colony.☆

SHOWY SASANQUAS

Several varieties will respond to careful planning in plant's northern range

■ A 10-year study at the National Arboretum in Washington, D.C., has established the Nation's Capital as the northernmost limit for raising the lovely evergreen sasanqua camellias.

The only exception to this rule would be northern Pacific Coast areas where winters are no more severe than in Washington.

ARS horticulturist Francis deVos, assistant director of the Arboretum, says that even in Washington sasanquas run the risk of severe cold damage. And they are not recommended for gardens in the suburbs, where winter temperatures are often 5 to 10 degrees colder than in the city.

The Arboretum tests, which involved several hundred plants representing about 100 different sasanqua varieties, prove that sasanquas are not as hardy as japonica camellias. Because of a belief to the contrary, sasanquas have been planted in many parts of the country where the climate is too cold for them.

Sasanqua camellias have many merits—ease of culture, lateness and showiness of bloom, and attractive year-round green foliage—and USDA is continuing to recommend them for Washington and areas with a similar or warmer climate.

Sasanqua culture in the plant's northern range requires well-protected slopes with an east-to-southeast exposure, deVos learned in the Arboretum experiment. The slopes should receive no less than 50 percent of the available sunlight during summer and fall. Like most broad-leaved evergreens, however, sasanquas need some shade in winter.

Lack of sun not only will reduce the number of flower buds but also may delay flowering so late in the fall that the blooms will not open. One season at the Arboretum, nearby deciduous trees had a tardy leaf fall and cast just enough shade so that the arrival of cold weather completely prevented some sasanqua varieties from blooming, even though they had abundant flower buds.

A garden wall can enhance the beauty of a sasanqua camellia.

Sasanquas are hardy at temperatures down to about 5° F., deVos found. Many varieties were damaged late in 1961, when the temperature dropped to 2° below zero at the Arboretum, and during the winter of 1962–63, when the average temperature was lower than it had been in 28 years.

DeVos also learned that sasanqua flower buds may be killed or badly damaged if the temperature drops as low as 18° F., a temperature that often is reached in Washington by mid-November.

Particularly showy varieties that can be grown in the northern limit of the sasanqua range include Cleopatra, Crimson Tide, Hino-de-Gumo, Jean May, Narumigata, Papaver, Pink Snow, Rosy Mist, Setsugekka, Shishi-gashira, Showa-no-sakae, and White Glory.

Of these, the ones most likely to be injured in a very cold winter are Papaver, Rosy Mist, Shishi-gashira, and Showa-no-sakae.☆

Fragile flowers of sasanquas like White Glory seem to belie their ability to withstand wintry weather.

INSTANT SWEETS

Versatile sweetpotato product helps rural economy, quantity cooking—and homemakers

■ Four manufacturing plants—all but one located in communities under 2,500 population—are now or soon will be producing instant sweetpotato flakes, a convenience food developed by ARS utilization scientists.

Two of the plants are in production, a third is making test runs, and the fourth is under construction as part of the Rural Areas Development program. Some sweetpotato flakes have reached retail markets, but most of the present production is going to restaurants.

Major use for sweetpotato flakes is expected to be in home meal preparation, although widespread use is anticipated in restaurants and as food for infants and older people. The flakes, developed at the Southern utilization research laboratory, New Orleans, reconstitute to a cooked mashed product with the addition of hot water or milk.

As an outgrowth of this research—

● Two sweetpotato flaking plants in North Carolina, one at Windsor (population 1,813) and one at Benson (population 2,355), are operated by Produce Processor, Inc., and Johnson Foods, Inc., respectively. The two plants have a combined capacity of about 900 pounds of dehydrated sweetpotato flakes per hour and employ between 60 and 80 people.

● Princeville Canning Co., St. Francisville, La. (population 1,661) is an established sweetpotato canning plant that has recently installed equipment capable of producing up to 700 pounds of sweetpotato flakes per hour from about 6,000 pounds of raw sweetpotatoes. The equipment has been test run several times and is expected to be in commercial production next season.

● Corbett Associates, Inc., has been granted a $105,100 industrial loan by the Area Redevelopment Administration of the Department of Commerce to help build a $204,010 sweetpotato flake plant at Ville Platte, La. (population 7,512), employing 30 to 40 people.

In addition to helping create more jobs in rural areas, and its value as a nutritious new "instant" food, the product is expected to halt the decline in sweetpotato consumption—from about 20 pounds per capita in 1944 to a low of about 6 pounds per capita in 1963—and help restore the crop to its former place in agriculture.

To manufacture the flakes, the sweetpotatoes must be washed, preheated in warm water, peeled, trimmed, cut into pieces, and cooked. The cooked sweetpotatoes are made into a puree and dried on a steam heated drum drier. As the material comes from the drier, it resembles a sheet of orange crepe paper. When broken into flakes, it is packaged.

Sweetpotato flakes can be packaged in metal containers in a nitrogen atmosphere and stored at room temperature for as long as 18 months without flavor losses. Although this type of packaging is well suited to institutional use, the industry is now investigating glass containers or flexible pouches to increase retail sales appeal and still protect the product's flavor and high vitamin C content.

The new industry will make full use of the less marketable but equally nutritious No. 2 and jumbo sweetpotatoes, some of which are now taken by freezers. As a result, both canners and freezers are expected to begin buying sweetpotatoes on field-run contracts, which would greatly strengthen the market.

Instant sweetpotato flakes, like many other convenience foods, offer American housewives a shortcut to rapid meal preparation. Mashed sweetpotatoes can be prepared from the flakes in 3 to 5 minutes, compared with about an hour for fresh sweetpotatoes and about half an hour for frozen sweetpotatoes.☆

Sweetpotato pie—a Southern delicacy—can be mixed in a twinkling.

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Efficient Use of Dishwashers

■ Whether an automatic dishwasher lives up to the owner's expectations depends a lot on the way the machine is used, ARS household equipment specialists say. It can save labor and do an excellent job of washing dishes.

Nada D. Poole and R. Katherine Taube have made several recommendations for more efficient automatic dishwashing, based on performance studies of representative types.

If the machine's cycle provides two separate washes and several rinses. usually there is no need to scrape and rinse the dishes before loading. If the dishwasher has a minimum cycle—only a wash and 2 or 3 rinses—dishes probably should be scraped and rinsed. This extra work can be eliminated, however, if the user stops the machine after the wash and first rinse, adds a second measure of washing compound, and resets the control for the complete cycle.

A single person—or very small family—can use a dishwasher efficiently by accumulating dishes for more than one meal, rinsing and storing them in the dishwasher until they make up a full load. For this purpose, some dishwashers include a "rinse-and-hold" setting in the cycle, which eliminates the need to hand rinse dishes before loading. The dishes can be rinsed in a machine without a rinse-hold setting, however, by manually setting the control for one of the regular rinses.

The specialists list three "musts":

- Be sure the water is at least as hot as 140° F. at the source. If the water heater tank is small, schedule dishwashing at times when hot water is not needed for something else.
- Load the dishwasher in such a way that the cleaning solution can reach the soiled surface of all items in the machine.
- NEVER use a hand dishwashing detergent or laundry detergent in a mechanical dishwasher. The speed of the washing mechanism will create a volume of suds which may cause flooding or even damage the machine.

These dishes will come out shiny bright.

The researchers suggest trying several of the special dishwashing compounds to determine the one best suited to local water conditions. Store the washing compound in a tightly closed container. Dishwashing compounds are especially susceptible to moisture and will deteriorate rapidly unless the container is air tight.

Before operating a new automatic dishwasher, each user should read the instruction booklet and follow directions carefully.☆